PATENT ABSTRACTS OF JAPAN

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(54) IMAGE ENCODERIMAGE DECODER AND OPTICAL DISK

(57)Abstract:

PURPOSE: To provide the image encoder for providing a compressed image having high picture quality and the image decoder for decoding those encoded data.
CONSTITUTION: A still picture discriminating means 202 for discriminating whether an input image is a still picture or nota frame erasing means 203 for erasing a frame from the input still picture and an encoding means 205 for performing variable length encoding are provided. When the input image is discriminated as the still picturethe frame at one part of the input image is erased and when data are not validthe operation of the encoding means is stopped. Besidesthe decoder is provided with a frame restoration information detecting means for extracting the information on frame restoration out of the datadecoding means 402 for decoding the variable length codeand frame restoring means 403 for outputting the image after inserting the frame to it. According to the information detected by the frame restoration information detecting meansthe input operation of the decoding means 402 is stopped and the frame restored by the frame restoring means 403 is outputted.

CLAIMS

[Claim(s)]
[Claim 1]When it has the following and said inputted image is judged to be a still picturedelete some frames of said inputted image which constitutes a still picture

from said frame deleting meansand said encoding means is receivedAn image encoding apparatus which sends a data effective signal which shows whether data is effectiveand is characterized by interrupting operation of said encoding means when data is not effective.
A still picture judging means which judges whether it is an image encoding apparatus which performs compression encoding of a picture using variable length codingand an inputted image is a still picture.
A frame deleting means which deletes a frame from an inputted image.
An encoding means which performs variable length coding.

[Claim 2]The image encoding apparatus according to claim 1 characterized by deleting the m frame (integer with which m:1 <=m<n is filled) when a still picture which carries out n frame (n is two or more integers) continuation is inputted in a frame deleting means.
[Claim 3]The image encoding apparatus according to claim 1 characterized by deleting a frame of up to [from the 2nd frame] the n frame when a still picture which carries out n frame (n is two or more integers) continuation is inputted in a frame deleting means.
[Claim 4]The image encoding apparatus according to claim 1 deleting only one frame and outputting a still picture of two frames when a still picture which continues three frames is inputted in a frame deleting means.
[Claim 5]The image encoding apparatus according to claim 1 deleting only one frame and outputting a still picture of four frames when a still picture which continues five frames is inputted in a frame deleting means.
[Claim 6]An image decoding device which is provided with the followinginterrupts input operation to said decoding means according to information detected by said frame restoration information detection meansand is characterized by outputting a frame restored by said frame restoring means.
A frame restoration information detection means which takes out information about frame restoration out of data which is an image decoding device which decrypts a picture coded using variable length codingand was coded using variable length coding.
A decoding means which decodes a variable length code.
A frame restoring means which inserts and outputs a frame to an outputted image from said decoding means.

[Claim 7]When it has the following and said inputted image is judged to be a still picturedelete some frames of said inputted image which constitutes a still picture from said frame deleting meansand said encoding means is receivedAn optical disc which sends a data effective signal which shows whether data is effectiveand is characterized by recording information coded by an image encoding apparatus which interrupts operation of said encoding means when data is not effective.
A still picture judging means which judges whether an inputted image is a still picture.

A frame deleting means which deletes a frame from an inputted image.
An encoding means which performs variable length coding.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention relates to the image encoding apparatus
which codes a video signal using variable length codingand the image decoding
device which decrypts the video signal coded using variable length coding.
[0002]
[Description of the Prior Art]The technique of compressing a prolonged video
signal into these archive mediaand recording it is examined with development of a
digital storage medium. Also in International Organization for Standardization
(ISO)the standardization activity of the video coding mode is performed by MPEG
(Moving Picture Image Coding Experts Group) of International Electrotechnical
Commission (IEC)For examplethere is "ISO/IEC 11172" etc.
[0003]In coding of MPEGrelative redundancy is dropped on both a time-axis and a
space axisand the amount of information is reduced. In order to drop the relative
redundancy of space shaft orientationsDCT (Discreate Cosine
Transform)quantizationand variable length coding are used. On the other handin
order to drop the relative redundancy of a time base directioncoding of the inter-
frame difference using correlation of the frame and the coding using a motion
vector are used. I-Picture coded only within a frame by MPEG without taking
other frames and correlationThere is three Picture type of P-Picture coded using
the prediction from the past Picture and B-Picture coded using the prediction
from both the past and the future. This situation is shown in drawing 1. Thusin
MPEGcompressing for the small amount of information is more possible by using
inter-frame correlation and using three Picture type like drawing 1 than coding
each frame within a framerespectively.
[0004]
[Problem(s) to be Solved by the Invention]The coding using three Picture type
mentioned above is dramatically effective to video with correlation strong against
a time base direction. Howeverto the still picture which carries out n frame (n is
two or more integers) continuationalthough the 2nd frame to eye the n frame was
the completely same picture as the 1st frameit had the technical problem that an
certain amount of amount of information will be given to all the frames.
[0005]It aims at acquiring conventionally the high-definition picture by which
compression encoding was carried out by this invention's solving an
aforementioned problem and assigning the amount of information of the part to
other frameswithout performing assigning the amount of information to the frame
of the same picture at all in the case of a still picture.

[0006]
[Means for Solving the Problem]In order to solve an aforementioned problem an image encoding apparatus of this inventionA still picture judging means which judges whether an inputted image is a still pictureand a frame deleting means which deletes a frame from a still picture inputted imageWhen it has an encoding means which performs variable length coding and is judged with a still picture by a still picture judging meansdelete some frames of an inputted image which constitutes a still picture from a frame deleting meansand an encoding means is receivedA data effective signal which shows whether data is effective is sentand when data is not effectiveit is the composition of interrupting operation of an encoding means.

[0007]A frame restoration information detection means by which an image decoding device of this invention takes out information about frame restoration out of data coded using variable length codingIt has a decoding means which decodes a variable length codeand a frame restoring means which inserts and outputs a frame to an outputted image from a decoding meansIt is the composition which outputs a frame which interrupted input operation of a decoding means and was restored by a frame restoring means according to information detected by a frame restoration information detection means.

[0008]
[Function]By the above mentioned compositionwith the image encoding apparatus of this inventionwhen judged with it being a still picture by a still picture judging meansafter deleting a frame in a frame deleting meansit codes in an encoding means. The amount of information currently assigned to such a redundant frame with the conventional image encoding apparatus becomes unnecessarysince some frames of a still picture are deleted before codingIt becomes possible at this rate to assign many amount of information to other framesand a compression encoding picture [high definition / before] can be acquired.

[0009]
[Example]Hereafteraccording to a drawingthe example of this invention is described in detail.

[0010]As the 1st exampleoperation of the image encoding apparatus of this invention is explained. The block diagram of the image encoding apparatus of the 1st example of this invention is shown in drawing 2.

[0011]The inputted image 201 goes into the still picture judging means 202 and the frame deleting means 203. In the still picture judging means 202it has a memory for one frame and the difference of the frame in front of one and the present frame is taken. When it is below a predetermined value with this difference valuethe inputted picture judges with it being the same still picture as the picture of one frame agoand outputs the still picture decision signal 204 to the frame deleting means 203. In the frame deleting means 203the frame judged to be a still picture is deleted according to the still picture decision signal 204and the data effective signal 206 which shows whether data is effective is sent. According to the data effective signal 206only the period when data is effective performs the

coding which used the variable length codeand the encoding means 205 outputs the output bit stream 207. It asks for the frame number deleted from the valid signal 206 of dataand the information is embedded into the output bit stream 207or the data effective signal 206 is sent to the decoding means of the next step as it is.

[0012]Drawing 3 shows the difference in the output of the image encoding apparatus of the 1st example of this inventionand the conventional image encoding apparatus. When the inputted image whose frame after No.8 the frame of No.1 to No.7 is an animation in a still picture is inputted into coding equipmentin conventional coding equipment. As shown in drawing 3it assigned one Picture type of IPand B also to the still picture frame of No.1 to No.7respectivelyand all the frames are coded.

[0013]On the other handin the image encoding apparatus of this inventionafter deleting the still picture frames from No.2 to No.7in order to codeas shown in drawing 3the still picture frames from No.2 to No.7 are not coded. Thereforethe amount of information currently assigned to the frame of this No.2 to No.7 with conventional coding equipment is enabled to assign other frames in the image encoding apparatus of this inventionand a high-definition compression encoding picture will be acquired rather than the conventional image encoding apparatus.

[0014]In this examplealthough explained taking the case of the case where all redundant frames (frame of No.2 to No.7 of drawing 3) are deleted to a still pictureit is necessary to not necessarily delete no redundant frames.

[0015]In this examplealthough it is considered as the predetermined value about the threshold of the inter-frame difference used for the judgment of a still picture by a still picture judging meanswhether this predetermined value is a fixed value or is a variable value which changes for every frameit cannot be overemphasized that it can operate similarly.

[0016]Nextthe image decoding device of this invention is explained as the 2nd example. Drawing 4 is a block diagram of the image decoding device of this invention.

[0017]The image decoding device of this example is an image decoding device in case the bit stream of an input is inputted intermittently and a data effective signal is sent simultaneouslyas shown in drawing 5.

[0018]The bit stream 401 goes into the decoding means 402decoding of a variable length code is performed and the decoded signal goes into the frame restoring means 403. The data effective signal 404 which shows whether data is effective goes into the decoding means 402 and the frame restoring means 403and according to the data effective signal 404when data is invalidit interrupts decryption operation for the decoding means 402.

[0019]On the other handaccording to the data effective signal 404the frame restoring means 403 also outputs the restored framewhen data is invalid.

[0020]Thusthe bit stream outputted with an image encoding apparatus as shown in the 1st example can also be correctly decoded by interrupting operation of decoding processingand inserting and outputting a restoration frame to an

interruption period according to a data effective signal.

[0021]Nextthe image decoding device of this invention is explained as the 3rd example. <u>Drawing 6</u> is a block diagram of the image decoding device of this invention.

[0022]Herethe example of an image decoding device in case frame restoration information is recorded into the bit stream is described.

[0023]The bit stream 601 goes into the decoding means 602 and the frame restoration information reading means 603. In the frame restoration information reading means 603the information about frame restoration is read from the bit stream 601. According to this read informationthe period which performs frame restorationThe transfer interruption signal 604 which interrupts operation of the decoding means 602 and interrupts sending of a bit stream to the sending area of the bit stream 601 temporarily is sentand the frame restored in the frame restoring means 605 is inserted and outputted.

[0024]Thusthe bit stream outputted with an image encoding apparatus as shown in the 1st example can also be correctly decoded by interrupting operation of decoding processingand inserting and outputting a restoration frame to an interruption period according to the data restoration information embedded into the bit stream.

[0025]Although the case where operation of a decoding means was interrupted for this example was describedif a bit stream is not inputtedit cannot be overemphasized that you do not need to make it interrupted if it is a decoding means which freezes the present frame until the following bit stream is inputted.

[0026]Nextas the 4th exampleoperation of the image encoding apparatus of this invention is explained. The block diagram of the image encoding apparatus of the 4th example of this invention is the same as that of the image encoding apparatus of the 1st example shown in <u>drawing 2</u>. Operation of the frame deleting means 203 differs from the 1st example.

[0027]When decoding the bit stream coded with the image encoding apparatus of the 1st examplethe information what frame of which still picture frame was deleted must be received from the inside of a bit streamor the exteriorand decoding operation must be controlled according to the information. For this reasonas the 2nd and 3rd example describedthe device for reading the information what frame of which still picture frame was deleted is needed.

[0028]This example explains the image encoding apparatus which such a special device is not needed by the image decoding device sideand can obtain a compressed image [high definition / image encoding apparatus / conventional].

[0029]There is a parameter for the 3-2 pulldown method of presentation which changes a film image (frame frequency of 24 Hz) into the usual video signal (frame frequency of 30 Hz)and outputs it in an MPEG standard. This is two parameterstop_field_first (it abbreviates to TFF hereafter)and repeat_first_field (it abbreviates to RFF hereafter).

The output of a decoding device with this parameter becomes like <u>drawing 7</u>.

When TFF is "H"first_field (subscript of f in <u>drawing 7</u>) is outputted previouslyandin

"L"second_field (subscript of s in drawing 7) is outputted previously. On the other handwhen RFF is "H"field previously outputted according to TFF is outputted repeatedly. Thusdisplay conversion to the usual video signal [film image / (frame frequency of 24 Hz)] (frame frequency of 30 Hz) is performed. Restoration of a frame is attained even if it does not prepare a special information reader by the image decoding device side by using this parameter to the information on a deletion frame. The situation of conversion is shown in drawing 7.

[0030]Operation of the image encoding apparatus of this example is explained referring to drawing 8. As shown in drawing 8when the still picture which continues to the frame of No.1 to No.12 is inputtedthe still picture judging means 202 is judged from No.2 to be a still picture. In the frame deleting means of this exampleafter the still picture judging means 202 judges with a still pictureonly when a frame is counted and a count is set to 4a data effective signal is dropped on "L" and a counter is reset. Simultaneouslythe memory which has memorized the frame in front of one to the judgment within the still picture judging means 202 is reset. Therebysince the data for a judgment is resetthe frame of No.6 is not judged to be a still picturebut is again judged from the frame of No.7 to be a still picture. Thusin the image encoding apparatus of this examplewhen a continuous still picture is inputtedit codes by deleting the picture of one frame every five frames. Under the present circumstancesas shown in drawing 8TFFRFF is inputted to an encoding meansand in an encoding meansthis TFFRFF is embedded at an output bit streamand is outputted.

[0031]Thusby deleting one frame every five frames to the continuous still picturethe amount of information currently conventionally assigned to this frame is enabled to assign other framesand a compression encoding picture [high definition / image encoding apparatus / conventional] is acquired. It is possible to decodeeven if it does not have a special information reader by the decoding device sidesince frame deletion which can be decoded using the information on TFFRFF is performed.

[0032]Although this example explained taking the case of the case where one frame is deletedevery five framesas shown in drawing 9even if it deletes one frame every three framesit cannot be overemphasized that it can operate similarly.

[0033]Nextthe optical disc of this invention is explained as the 5th example. The optical disc in the 5th example of this invention is an optical disc which is recording the information coded with the image encoding apparatus as shown in drawing 2. The optical disc of this invention is recording the higher-definition picture to the optical disc which records the information coded with the conventional image encoding apparatus. The optical disc of this example by using the amount of information distributed with the image encoding apparatus of this invention for the improvement in image quality for the improvement in the record time in the conventional optical disc. It is dramatically effective also as an optical disc which it becomes possible to record the prolonged information which was not able to be recordedand records prolonged picture information.

[0034]As mentioned aboveif the image encoding apparatus and image decoding

device which were described in the 1st to 4th example are useda compression encoding picture [high definition / image decoding device / the conventional image encoding apparatus and] can be acquired.

[0035]It cannot be overemphasized that it can operate similarly about the device made combining the device described in the 1st to 4th example.

[0036]

[Effect of the Invention]The still picture judging means the image encoding apparatus of this invention judges whether an inputted image is a still picture to be as mentioned aboveWhen it has a frame deleting means which deletes a frame from an inputted imageand an encoding means which performs variable length coding and is judged with a still picture by a still picture judging meansafter deleting some frames of the frame which constitutes a still picture from a frame deleting meansit is the composition which codes by an encoding means.

[0037]The amount of information currently conventionally assigned to the continuous still picture frame by this can be deletedit becomes possible to assign this amount of information to other framesand a compression encoding picture [high definition / before] can be acquired.

[0038]A frame restoration information detection means by which the image decoding device of this invention takes out the information about frame restoration out of the data coded using variable length codingIt has a decoding means which decodes a variable length codeand a frame restoring means which inserts and outputs a frame to the outputted image from a decoding meansIt is the composition which outputs the frame which interrupted the input operation of the decoding means and was restored by said frame restoring means according to the information detected by the frame restoration information detection means.

[0039]Therebyrestoration becomes possible as [bit stream / which was coded with the image encoding apparatus of this invention] usual.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The figure of arrangement of the frame of an MPEG system

[Drawing 2]The block diagram of the image encoding apparatus of the 1st example of this invention

[Drawing 3]The figure showing operation of the image encoding apparatus of the 1st example of this invention

[Drawing 4]The block diagram of the image decoding device of the 2nd example of this invention

[Drawing 5]The figure showing the input of the image decoding device of the 2nd example of this invention

[Drawing 6]The block diagram of the image decoding device of the 3rd example of this invention

[Drawing 7]3-2 of MPEG —— the figure showing the pulldown method of

presentation

[Drawing 8]The figure showing operation of the image encoding apparatus of the 4th example of this invention

[Drawing 9]The figure showing operation of the image encoding apparatus of the 4th example of this invention

[Description of Notations]

201 Inputted image

202 Still picture judging means

203 Frame deleting means

204 Still picture decision signal

205 Encoding means

206 Data effective signal

207 Output bit stream

401 Input bit stream

402 Decoding means

403 Frame restoring means

404 Data effective signal

601 Input bit stream

602 Decoding means

603 Frame restoration information reading means

604 Transfer interruption signal

605 Frame restoring means